

The Upland Settlement Project of Bangladesh as a Means of Reducing Land Degradation and Improving Rural Livelihoods

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Abstract Because of illegal logging, increased population pressure and intensified shifting cultivation, forest coverage of the Chittagong Hill Tracts (CHT) has decreased drastically resulting in land degradation. Many development projects have been implemented to combat forest loss and land degradation and also to improve the livelihoods of the hill people. This paper reports an empirical study of the Upland Settlement Project (USP) of Bangladesh which was undertaken to prevent land degradation and enhance the standard of living of the people. Planters were found to have given up shifting cultivation and adopted soil conserving agroforestry practices, and forest coverage has been increased in the project village. Interacting with project staff members, government officials and NGOs assisted planters in diversifying livelihood strategies thereby reducing dependency on project resources. Rich planters, utilizing their own capacity, expanded their income sources successfully. Poor planters still remain wage labourers because they do not have sufficient finance and networks to invest in productive ventures. Planters' participation in project activities and the information flow between them and project staff were found to be minimal. Suggestions are made for the continuity of project functions, which involve greater participation of planters in rubber management functions, improved information flow, resolution of land tenure and greater equality in distribution of rubber revenue.

Keywords Chittagong Hill Tracts · Shifting cultivation · Rubber plantation · Rural livelihoods · Social capital

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Introduction

In developing countries, more than two-thirds of rural people live in forested marginal upland areas (Scherr et al. 2004). These people are diverse indigenous communities (Cairns and Garrity 1999) who practice various forms of shifting cultivation (Clermont-Dauphin et al. 2005). For centuries, shifting cultivation was the primary mode of use of tropical forests among the indigenous people inhabiting the humid tropics (Toledo et al. 2003). Due to population pressure, indiscriminate illegal logging in forest areas and lack of suitable land, shifting cultivators nowadays are forced to use a shortened fallow period resulting in falling yields. Farmers involved with shifting cultivation have experienced food shortage and adopted some non-farm activities including wage labour and intensified illegal extraction and selling of forest products to sustain their living (Nath et al. 2005). However, lack of employment in remote hilly areas and decreasing availability of forest resources make their livelihoods vulnerable.

Governments of developing countries have introduced social forestry programs to support the livelihood of these forest-dependent people and increase the forest areas. In the early 1980s the government of Bangladesh undertook a social forestry project known as the Upland Settlement Project (USP) in degraded forest areas of the Chittagong Hill Tracts (CHT) (Chittagong Hill Tracts Development Board 2001). The USP has rehabilitated landless *jhumias* (shifting cultivators), through a number of agroforestry and social development functions including capacity building and infrastructure development (Khan et al. 2003). The *jhumias* consist of 11 ethnic communities who practice various forms of shifting cultivation (*jhum*) in the CHT region.

There have been several studies of the effects of participatory forest management (PFM) on livelihood and poverty of the participating farmers. Safa (2004) studied the asset creation and poverty reduction impact of PFM in sal (*Shorea robusta*) forest areas of Bangladesh. In another study, Safa (2006) examined social forestry programs of NGOs in terms of sustainability, resource utilization and impacts on rural livelihood. Quddus et al. (1992) reported social and economic impacts of Betagi-Pomora social forestry project in Chittagong district of Bangladesh. They found that economic conditions of the settled families improved and settlers adopted soil conserving agroforestry practices. Drawing on extensive literature review, Zashimuddin (2004) reported that community forestry (CF) has generated sufficient resources and income to raise the rural poor above subsistence level and CF play a significant role in rural poverty alleviation in Bangladesh. ADB (2005, 2007) reported that project beneficiaries seem to have increased their average annual savings, accumulated assets and improved their social status as a result of their participation in the forestry projects. Tree cover has also increased in project areas. However, these ADB reports have not provided data to understand the impact of these projects.

Two research projects have investigated the performance (Khan and Khisa 2000) and poverty reduction impacts (Khan et al. 2003) of the USP. The former study mainly reported the physical achievements of the project, land use status in project areas and state of farmers' participation in project activities, including the

development of agroforestry and rubber plantations. The later study found that farmers' income levels have been increased along with social recognition and expansion of tree coverage and reduction of soil erosion. These studies in the USP were carried out by focus group discussions, ethnographic observations and unstructured interviews; they had insufficient data (for example on livelihood assets) to fully understand the impacts on livelihoods. Therefore, the present study was carried out to explore the impacts of the USP on livelihoods of the planters and how the project helped to prevent land degradation. Five types of livelihood capital—namely human, physical, natural, financial and social capital—of the sustainable livelihood (SL) framework were examined, as well as planters' participation in project functions, information flow and livelihood diversification strategies.

The paper begins with a brief description of the USP, and then elaborates the methods used in data collection. Impacts of the project on reduction of land degradation and on planters' livelihoods are then examined. Next, observations are made about the problems of the planters. Concluding comments follow.

A Brief Description of the Project

The rationale for implementing the USP emerged from a soil and land-use survey undertaken in 1964 by Forestal Forestry and Engineering International, Canada, which concluded that the CHT region was unable to support its growing population despite a lower population density than in the lowlands. Hence, an alternative strategy for food and ecological security, preserving at the same time the socio-ecological integrity of the ethnic population, was necessary. The Chittagong Hill Tracts Development Board (CHTDB), a premier government agency that conducts most of the development work in the CHT, implemented the USP in two phases.

The Asian Development Bank (ADB) funded the first phase of the USP from 1985 to 1993, by settling 2000 ethnic families and establishing 1,620 ha of homestead agroforestry and 3,240 ha of rubber plantations in 39 project villages in the Khagrachari district. Considering the success of the first phase, the second phase of the USP was formulated with the following objectives (Chittagong Hill Tracts Development Board 2001):

- settlement of landless ethnic farmers (*jhumias*) in suitable areas in Khagrachari and Bandarban districts
- development of suitable unused upland areas for diversified horticulture, agroforestry and rubber plantations to increase farm income and create rural employment opportunities, and
- long-term socioeconomic development of target groups.

The short-term objective has been to improve the economic conditions of the planters (project participants) (Chittagong Hill Tracts Development Board 2001).

This phase was financed by a government grant under the Ministry of CHT Affairs. Even though the original project period was 1993–2000, it was extended to the 2006–2007 fiscal year in order to complete the establishment of rubber

Table 1 Some basic information of the USP second phase

Acquired project area: 2,126 ha
Social facilities
Number of community centres: 4
Religious centres: 8
Primary schools: 5
Ring-well/Tube-well: 48
Earthen dam: 20
Tarred road: 35 km
Rubber factory: 4
Ethnicity status
Marma group: 371 planters
Tripura group: 432 planters
Tongchaynga group: 158 planters
Chakma group: 39 planters

Source: (CHTDB 2005)

processing units, project funding ending in June 2007. During this phase, 506 ha of homestead agroforestry and 1,620 ha of rubber plantations were established. Some basic features of this phase of USP are summarized in Table 1.

Due to remote location, lack of accommodation, poor communication services and civil unrest, the project manager advised against conducting a study in Khagrachari district. Therefore, the study was conducted in the second phase of USP in Bandarban District (Fig. 1). It was assumed that

- planters would not be able to recall the project history and activities of first phase of the project that ended in 1993;
- the project authority applied their first phase experience¹ to make the second phase more successful and
- as the second phase was still in progress, planters would be able to provide recent and authentic information.²

Research Method

The Upland Settlement Project budget and staff assistance were allocated equally to all 10 project villages, and hence it was thought that an in-depth study in one village would produce useful information. A typical single case study can capture the circumstances and conditions of a commonplace situation and lessons learnt from such a case can be acceptably informative about the average situation (Yin 2003). *Chemi-I* project village in Bandarban district was selected for the case study.

¹ For example, the project authority introduced intercrops in an early stage of rubber plantations during the second phase of USP.

² This approach is consistent with recommendations made by Prokopy (2005).

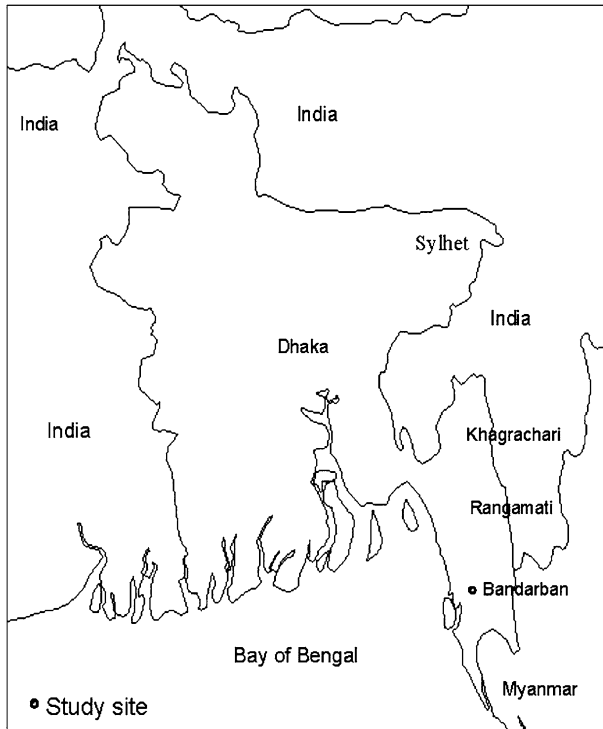


Fig. 1 Map of Bangladesh showing the locations of the USP and study site

An earlier study by (Saha and Azam 2004, 2005) examined the status and impacts of betel leaf agroforestry on livelihoods of Khasia ethnic people by selecting one sample village out of 10.

The study was conducted through a number of steps. The first step was a village walk with project staff and the village leader (*karbari*) to ascertain general features of the village including forest conditions (in terms of tree growth, density and composition), land uses, and the village road (a mixture of earth and tar seal) and construction materials used for planters' houses. House construction³ and talks with the leader revealed a wealth disparity among planters. Therefore, following Grandin (1988) a participatory wealth ranking⁴ exercise was conducted with the help of four key-informants including the village leader. These informants were chosen from four parts of the village representing three wealth classes and it was assumed that they would provide reliable information because they knew all planters.

³ Initially, houses (bamboo matt wall with tin roof) of all planters were constructed by the project. After a few years, many planters renovated their houses, and some built new houses with brick and mud walls and high quality tin (galvanized iron) sheets.

⁴ For wealth ranking, a list of all household was prepared, with a separate card number with the name of household head for each household. All cards were then ranked by the key informants independently, based on criteria each chose following their discussion. Finally, three wealth groups—labelled rich, middle and poor—were identified.

During the second step, quantitative data were collected by means of a survey using a checklist and semi-structured questionnaire. The questionnaire⁵ was tested by a preliminary survey before the main survey and across all wealth groups and afterwards six questions were modified. The questions were designed to collect data on five forms of capital (human, physical, natural, financial and social capital) of respondents based on the sustainable livelihood (SL) framework described by Scoones (1998) and DFID (2001). The SL framework is widely discussed by scholars (Cramb et al. 2004; Soini 2005) in analyzing poverty issues, livelihood strategies and diversification, and the impacts of development intervention on the livelihoods of the rural poor. It is increasingly being accepted as providing a basis for both understanding the nature of poverty and identifying the types of strategies that can reduce poverty in an effective and sustainable manner (Reddy et al. 2004).

The SL framework is useful in explaining the interrelationships among the various forms of livelihood capital and utilization of this capital in diversifying livelihood strategies to attain desired outcomes (e.g. increased income and stable natural resource base) under the available enabling environment (e.g. policies and institutions). It provides a more rounded picture of the complexities of living and surviving in poor communities than do understandings based on measures of income, consumption, and employment (Brocklesby and Fisher 2003). Twenty-four planters, selected by proportional stratified sampling, out of 48 were interviewed during May–September 2005. It was assumed that 50% randomly and proportionately selected sample planters from three wealth categories would provide sufficient information of the study village. Saha and Azam (2004, 2005) also conducted studies in a Bangladeshi ethnic village by sampling 50% of households (20 out of 40). All selected planters cooperated in the survey. Some planters were revisited on the day following the interview to clarify confusing data. Project staff and village boys always assisted the survey work with transport and providing direction to the houses of the sampled planters but they were not present during interview sessions.

Information was sought on weekly expenditure on food, education, health care, crop production, livestock rearing and social events (religious festivals). In addition, respondents were asked how much they had earned in the previous year (2004) from all sources. Even though income and expenditure estimates were inexact, these provided a general picture of the savings. Direct estimation of the household savings proved difficult because planters were reluctant to provide the information. Costs of cropping activities were derived from respondent's recollection of annual expenditure on planting materials, fertilizer and labour. The monetary values of physical capital (including television sets, cassette players and water pumps) were their estimates of resale values. Likert scales (for example, 1 = agree strongly through to

⁵ The check-list for semi-structured interviews included human and physical capital (including family size, education, members contributing cash income, landholdings and ownership, livestock, housing conditions and household appliances), natural capital (including agroforestry system and its components, forest conditions), financial capital (including credit, and food security status), governance issues including participation, and equity in access to various benefits (including employment and information flow), and social capital (including groups and networks, trust and solidarity, collective actions, information and communications, social cohesion and inclusion, and empowerment).

5 = disagree strongly) were used for measuring variables of trust and solidarity under social capital.

During the third step, qualitative information was collected through key-informant interviews, two group discussions with planters, open-ended conversations with villagers of various ages, informal discussion with project staff, and personal observation. Three project staff members (separately) and four planters took part in key-informant interviews. Project staff provided information about the outcomes of the project, status and productivity of rubber plantation, benefit sharing, land tenure, and future plans about management of rubber plantation. The interviews with planters sought information about their means of livelihood before and after joining the project, local organizations, participation in project activities, benefits of the project, choice of species for homestead agroforestry, and forest conditions in terms of growth and stock.

In the two group discussions, six and eight planters were present and highlighted issues including species composition in homestead agroforestry, merits and demerits of alternative production technologies, socio-economic status before and after joining the project, livelihood diversification strategies, and collective activities. Following Mukherjee (1998), vector scoring⁶ and seasonal diagramming⁷ were used to analyse the problems of planters including seasonal problems, their impacts and possible solutions. Information was written down during interviews and discussions, cross-checked by reading these in front of respondents and then elaborated upon at night at the guesthouse where the interviewers stayed during field data collection. Semi-structured questionnaires, with questions for group discussion only, were used to facilitate the group interviews and discussions. Interviewers talked with planters about their social issues such as social relations, conflicts, leader's activities, their education and their daily activities.

During the fourth step, homestead agroforestry areas of respondents were visited, the species composition identified and the number of trees (including saplings) enumerated. One-way analysis of variance was conducted to find the statistical differences of some variables among three categories of planters.

Study Findings and Interpretations

Features of the Study Village

A brief typology of the study village is presented in Table 2. More than 80% of the village land is in the upland and suitable for plantations. The majority of the planters in this village are of the Marma⁸ ethnic group (39 planters out of 48) and are related to each other, even though some of them came from different parts of the CHT.

⁶ Vector scoring is a visual method and involves scoring of items for assessing their relative importance so as to prioritise problems. This method helps in decision-support by prioritizing concerned items.

⁷ In seasonal diagramming, villagers can show by diagrams and charts the seasonal variations in different aspects of rural livelihood including availability of food and employment. The chart thus formed could be linked directly to policy measures in terms of problems identified during the exercise.

⁸ Marma ethnic group is dominant in the Bandarban hill district as well as in USP villages in Bandarban.

Table 2 Typology, features of sampled USP village, Bandarban, Bangladesh

Topographic feature: Hilly topography with moderate slope

Land categories
First class: Plain land used for irrigated rice cultivation, very limited (about 5% of total land area)
Second class: Somewhat elevated land used for rain feed rice cultivation, fairly available (about 15%)
Third class: Upland suitable for forestry practices, available (about 80%)
Distance to nearest medical facilities: 9 km
Distance to main road: 600 m
Distance to market: 9 km
Distance to district headquarters: 22 km
Vehicle accessibility: Tarred approach road linked to main road
Electricity power: Not available
Source of lighting: Kerosene
Fuel source: Wood
Drinking water source: Major source-streams and seepage water; minor source-ring well and tube-well
Distance to government schools: 3–9 km
Total planters: 48

They enjoy a friendly relationship with other minor ethnic groups namely the Chakma (five planters) and the Tongchaynga (four planters). Planters depend on natural resources for fuel and drinking water. In order to analyse the impacts of the project, it is necessary to know about the socio-economic characteristics of the planters. Project staff reported that no baseline survey of the planters was conducted before initiation of the project. Khan and Khisa (2000) observed for a similar situation the difficulty of making a comparative analysis of the socio-economic and demographic status of the participating families in the USP. However, the key-informants and planters attending group discussions commented that before joining the USP, most of them had no personal agricultural land and practiced *jhum* on government *khas* land. Some of them previously lived far from the project village and others lived in nearby villages. Most of them were daily labourers in nearby agricultural land, and extracted and sold forest products including timber, fuelwood and non-timber forest products. Some practiced rice cultivation on leased land. Khan et al. (2003) found that before joining the USP, the average annual income of planters was not more than Tk.6000 (1 US\$ = Tk.65, as of 2005).

Wealth ranking among planters revealed that the possession of first-class agricultural land and livestock (mainly cows) was the main reason for differences (Table 3). The rich and some middle-wealth planters owned first-class agricultural land before joining the project. Some of them commenced small village trade activities after joining the project. The son of the village leader started fish farming by leasing two water reservoirs. These economic opportunities increased their wealth. Poor planters still depended on wage labour to maintain their livelihoods. Even though landless *jhumias* were supposed to be the planters in the project, some rich farmers were also selected thus removing the opportunity for more landless *jhumias* to benefit from the project. One project staff officer pointed out that as soon

Table 3 Grouping of planters into three categories based on participatory wealth ranking methods

Wealth category or rank	Wealth indicators	No. of planters
Rich	First-class landholders	7
	Have sufficient food and even a surplus	
	Own livestock, mainly cows	
	Have non-agricultural income sources including services and business	
	Have more educated members	
Middle	Have brick-walled houses	12
	Have limited first-class land, leased agricultural land or both	
	Most planters have sufficient food	
	Some have a food shortage for 2–3 months each year	
	Own livestock, but fewer cows than the above	
	Have off-farm income such as from services, their own business	
	May labour on other farms	
Poor	Have mud-walled houses with tin roofs	29
	Almost no agricultural land except project land	
	Insufficient food	
	Most work as daily labourers	
	Own livestock, but few cows, if any	
	Mud-walled houses with sun grass roofs	

as the project budget was released, planters were selected hastily without applying the announced criteria. If the criteria had been adopted, the selection of planters in 10 project villages would have taken a long time and would have held up other project activities.

Reduction of *Jhum* Intensity and Expansion of Forest Coverage

The project was designed to both reduce the intensity of *jhum* and to expand forest cover. It was found that although planters were *jhumias*, they have now given up *jhum* completely and carry out homestead agroforestry, and those who own agricultural land or can lease land now practice irrigated agriculture. Each planter was allotted 2.1 ha of degraded forestland to establish a homestead and grow rubber trees. Even though the project authority was supposed to provide legal and permanent land tenure to planters, the planters are still waiting for land certificates. Every planter of the project village raised 0.5 ha of homestead agroforestry, in accordance with the project's objectives. The project authority supplied all the necessary materials, including seedlings, fertilizers, tools and technical support.

Planters said that before the inception of the USP, adjacent villagers practiced *jhum* extensively in the project area. A few broken-top big trees and scattered thick

bushes remained. The USP enriched plant diversity by allowing planting of new species. Forty-three different plant species, including fruit and timber species and vegetables, were identified in sampled planter's homestead agroforestry. Teak (*Tectona grandis*), gamar (*Gmelina arborea*) and koroi (*Albizia* spp.) were the preferred timber species. The fruit trees included kanthal (*Artocarpus heterophyllus*) and aam (*Mangifera indica*). Planters grew various vegetable species along with trees on their homestead land to supplement their diet. The tree density at homesteads averaged 713 trees/ha (including saplings), and at most homesteads these were vigorous and well tended.

Between 1995 and 1999, the project authority raised 81 ha of rubber plantation in one block that was intercropped during the first 3 years with bananas, papaya and pineapples. The project manager reported that within the 81 ha rubber plantation, every planter had a share of 1.6 ha of their total granted land. However, the interview team did not notice any demarcation of individual parcels of land. The project authority supplied all planting materials, fertilizer and other necessities; planters only provided wage labour and protected the rubber plantation from cattle. Observations and discussions with project staff and planters revealed that the plantation was more than 90% stocked with trees which were growing satisfactorily. Latex collection began in 2005.⁹

The USP has been able to stop *jhum* in this project village and motivate planters to develop homestead agroforestry and rubber plantings. It was observed that in surrounding non-project villages, villagers continue to practice *jhum*, and ginger cultivation that exposes top soil during planting and harvesting which may accelerate soil erosion. Personal observation and opinions of project staff and planters in the USP village revealed that increased tree coverage helped to reduce soil erosion and addition of plant materials to the ground improved water holding capacity and fertility of soil.

Impacts of the USP on Livelihood of the Planters

The livelihood of planters was investigated through five categories of capital in the livelihood framework.

Human Capital

The project had an impact on the creation of human capital (education and skill) through training. The project established an informal village primary school and encouraged planters to enrol their children. Although household heads (respondents) of the USP are mostly illiterate, they have become aware of child education since joining the project and also because of contact with several NGOs and some of their children have secondary, higher secondary and even tertiary education (Table 4).

⁹ From May to August 2005, rubber production was four tonnes of RSS (Ribbed Smoked Sheets) from 81 ha of rubber plantation, with a market value of about Tk.360,000. The project manager claimed that this production was satisfactory, even though it was experimental using a hand-driven machine for preparing rubber sheets from latex. Future production is expected to be greater (Chakma 2005).

Table 4 State of human capital among planters in the study village

Types of human capital	Planter category		
	Rich	Middle	Poor
Mean family size (no.)	6	5	5
Literacy (%)			
Total	56	52	39
Primary	12	16	30
Secondary	24	28	9
Higher secondary	16	8	–
Graduate	4	–	–
Male/female literacy (%)	32/24	40/12	23/16
Parents' literacy (%)	75	20	40
Mean number of members per family contributing cash income	3	3	2

They also mentioned that if their children obtained at least secondary education (10 years of schooling), they would be able to find employment which may help them to improve their livelihood.¹⁰ Among three groups of planters characterized by wealth, differences were observed in cases of education, at secondary, higher secondary (12 years of schooling) and tertiary levels. Rich and literate middle category planters send their children to higher education institutions that are mostly located at the district headquarters. About 75% of the children of poor category planters did not continue education after primary schooling.

Project staff members provided training to planters on nursery seedling raising, planting techniques, establishment and maintenance of contour hedgerows, tapping rubber trees and processing of raw latex to produce rubber sheets. Planters believed that, due to this training, their trees have better growth and survival rates. Because of their increased skills, five of them found employment in nearby private rubber plantations.

Physical Capital

Differences were observed in physical capital among three groups of planters. Based on respondent's assessment, a highly significant variation ($P < 0.001$, $F = 11.12$) in the mean value of household appliances was found among the three categories of planters, the rich planters possessing high-priced appliances such as television sets and rice grinders (Table 5); these had been acquired since joining the project. The project authority has constructed secondary tarred roads that link all project villages with the main road and with one community centre, and has provided concrete rings and tops for making safe latrines. The roads play an important role in the village economy. This is evident from the comments of the planters that '*age pach (5) ari*

¹⁰ Ngugi and Nyariki (2005) mentioned the significance of education for improving livelihood, and stated that poverty is closely associated with low levels of education and lack of skills.

Table 5 State of physical capital among planters in the study village

Types of physical capital	Planter category		
	Rich	Middle	Poor
Household appliances (% of planters)	100	60	33
Rice grinder machine (% of planters)	25	–	–
Agricultural tools (% of planters)	100	100	100
Mean equivalent money (Tk.)	13175	2220	1293
Livestock (no.) ^a			
Cows	6.5(100)	3.75(80)	3.2(33)
Goats	4.5(100)	–	3(26)
Chickens	14(100)	13(100)	12(87)
Pigs	1.5(14)	–	1.5(13)

^a Figures in parenthesis indicate percentage of planters

dhan Bangalhali *bazare nite* Tk.100 *lagto*, *r ekhon lage matra* Tk.10', meaning that before the project they needed Tk.100 to transport five *ari* (about 40 kg) of rice to the Bangalhali bazaar for sale, and now they pay only Tk.10. All rich and some middle-wealth and poor planters own cows while all planters raise poultry (mainly chickens) (Table 5). The planters had previously carried out open-grazing of their livestock, but they are now motivated to use stall-feeding to prevent cattle from damaging the rubber plantation.

Natural Capital

This is defined to include landholdings (used in the wealth categorization) and forest conditions (Table 6). Even after 10 years of involvement in the project, planters still do not have permanent, legal land certificates. This situation creates misunderstanding between planters and the project authority. All planters rated the forest conditions in respect of subsistence and commercial values as either 'good' or 'very good'.

Table 6 State of natural capital and forest conditions in the study village^a

Livelihood capital category	Planter category		
	Rich	Middle	Poor
Mean landholdings (ha)	4.83	2.45	2.14
Own agricultural land (ha)	1.01(75)	0.53(40)	–
Leased agricultural land (ha)	0.57(50)	0.36(40)	0.32(13)
Hill (ha)	2.28(75)	–	–
Project land (ha)	2.1	2.1	2.1
Forest conditions ^b			
In terms of subsistence value	3.5	3.6	3.27
In terms of commercial value	3.25	3	3

^a Figures in parenthesis indicate percentage of planters

^b Figures derived using average of four scales (4 = very good, 3 = good, 2 = fairly good, 1 = not good)

Financial Capital

Planters have access to credit facilities in both the government and non-government sectors which was not possible before joining the project because there were no NGOs in their areas. Because planters now live in a village and road access is easy, several NGOs have established activities in the village. Rich planters who have their own land (excluding project land) with legal title certificates can obtain loans from formal banks including Krishi Bank, for which the interest rate is lower than that of non-government banks including Bangladesh Rural Development Board (BRDB), Bangladesh Rural Advancement Committee (BRAC, a national NGO), and Integrated Development Foundation (IDF, a local NGO). Rich planters take out loans for expanding their businesses (for example, establishing a fish farm) while middle-wealth and poor planters borrow for purchasing breeding stock (Table 7).

Social Capital

The project helped to build social capital among planters through settling them in a permanent village and through the formation of a village committee. Planters then developed social relationships among themselves and with project staff and neighbours (nearby villagers). Besides involvement with several local organizations, the household communication networks (HCNs)—number of households within or outside the village with whom planters could share their feelings, ask for help or request a loan—are striking (Table 8). The size of HCNs of rich planters is almost twice that of poor planters ($P < 0.002$, $F = 8.21$). Rich planters have more networks with peers than middle-wealth and poor planters. This is consistent with the number of people willing to give money in an emergency and the number of people currently able to provide money in an emergency. Both of these variables differ significantly among the three groups of planters ($P < 0.03$, $F = 3.87$ and $P < 0.003$, $F = 7.75$, respectively).

Table 7 Situation of financial capital among planters in the study village

Types of financial capital	Planter category		
	Rich	Middle	Poor
Fish farms (no.) ^a	2(14)	—	—
Planters having loans (no.)	3	3	4
No. of loans	1.67	2	1.25
Sources and amount (Tk.)			
Krishi Bank	15,500	5000	—
BRDB	5333	4333	5000
BRAC	—	4000	1000
IDF	—	3000	—
Food security (% of planters)			
Surplus	50	—	—
Sufficient	50	60	—
Shortage	—	40	100

^a Figures in parenthesis indicate percentage of planters

Table 8 Some selected variables of social capital among planters of the studied USP village of Bandarban, Bangladesh

Types of social capital	Planter category		
	Rich	Middle	Poor
Groups and networks ^a			
No. of organizations involved	3	5	3
Household communication networks (HCN)	13	8	6
No. of people willing to help by giving money in emergency	7	7	4
No. of people currently able to provide this money	4	7	2
Opinion on the following statements: trust and solidarity ^b			
Most people living here can be trusted	2	2	2
One has to be alert or someone is likely to take advantage of you	4	4	4
Most people are willing to help if needed	1.75	2	2.73
People generally do not trust each other in lending or borrowing money	4.25	3.6	3.93

^a Values were derived from survey responses

^b Values indicate averages of the five point scales used

Comparatively rich planters have a greater chance of obtaining help from their neighbours because the lenders believe that rich planters will be able to pay back the money quickly. The scores for trust and solidarity indicate that planters have faith in village people and help each other when needed, even though they originate from different parts of the region. All planters have easy access to information related to farming systems through project staff, relatives and neighbours.

Besides the social capital of individuals, collective social capital in the form of collective actions was observed. All planters perform some social development functions such as road maintenance, *kheyang* (Buddhist temple) development, maintenance of water sources, and farming. During the first three years of the rubber plantation, all planters cultivated intercrops collectively and the sales revenue (about Tk.70,000) of these crops was deposited in a committee common fund.¹¹ With the financial help of a NGO, they cultivated 2 ha of land with ginger in 2005. On average, planters now contribute 6–7 days a year to common village works.

Income–Expenditure Situations and Livelihood Diversification Strategies

The income–expenditure and the major sources of funds for 2004 are reported in Table 9. Both agriculture and service provided major income to rich and middle-wealth planters while rubber tapping and wage labour contributed most income to poor planters. The mean gross annual income of planters varied significantly

¹¹ The project village committee has a common fund deposited in a bank account. At the time of joining, each planter contributed Tk.500 to the common fund and another Tk.20,000 from leasing of *gudha*. This fund is utilized for the welfare of the planters and common development. For example, if any planter needs money in case of an emergency situation such as expensive medical treatment, the committee provides an interest free loan for a specified time. Tk.12,000 from this common fund was also spent on the repair of the *gudha*.

Table 9 Mean cash income-expenditure situation of planters of the studied USP village of Bandarban, 2004

Variable	Planter category		
	Rich	Middle	Poor
Income (Tk.) and sources			
Rice	11,500	–	–
Hill garden	25,500	–	–
Fish farm	4480	–	–
Business	8064	1824	–
Service	54,900	25,920	5440
Homestead forest products			
Wood	2488	3430	1436
Fruit	650	1050	1298
Livestock			
Chickens	1842	1090	808
Cows	11,000	1200	105
Goats	1500	–	119
Rubber tapping	–	3600	10,512
Wage labour	–	4737	17,490
Bamboo and cane products	–	1800	224
Mean income	12,1924	44,651	37,432
Expenditure (Tk.) and sources			
Food	19,800	29,760	24,880
Health care	2575	1650	380
Education	2750	1640	572
Livestock	4250	–	–
Social work	1100	195	115
Agriculture	12,263	3000	312
Mean expenditure	42,738	36,245	26,259

between the wealth categories, from Tk.121,924 for rich planters to Tk.37,432 for poor planters ($P < 0.000$, $F = 16.33$).

The mean expenditures across the three categories of planters were not significantly different, although middle-wealth and poor planters spent more than 90% of their money on food, and collected some vegetables from the surrounding forests. The expenditure–income figures indicate that most planters have been able to allocate money for their other needs including clothing, social events and marriages.

Table 9 also shows that current income from project functions (e.g. income from agroforestry and from rubber tapping) is insufficient to provide full livelihood support, hence planters diversify their livelihood strategies. Table 10 reports the current occupations of planters' family members. For the poor planters, the strategies include livestock rearing, making bamboo and cane products (e.g. bamboo mats used for drying rice) and wage labour. Being located near the plains, poor planters can obtain agricultural employment all year round. They also engage in

Table 10 Current occupational status of planters' family members (%)

Occupation	Planter category		
	Rich	Middle	Poor
Agriculture	100	80	13
Service	75	40	3
Non-farming business	25	1	–
Fish farming	25	–	–
Tapper	–	50	78
Daily labour	–	50	93
Crafting	–	20	7

supplying wood to a paper mill. Some poor and middle-wealth planters work in the textiles industry and in hospitals. Rich planters expand their agricultural fields and fatten cattle. Some family members of rich and middle-wealth planters work in government sectors, including education, health and defence. Project staff members said that after joining the project, planters become aware of job opportunities in city areas. This is the result of planters' interactions with project staff, NGOs and other officials who come to visit the project occasionally.

Planters are no longer dependent exclusively on direct project support for their living. They have found ways to diversify their livelihood strategies. Project staff reported that experimental latex collection provided employment for only 16 planters, but all planters will have employment at full production (which was expected to be mid 2007), earning at least Tk.90/day for 167 days a year. Moreover, their shares from rubber sales would be highly valuable.

Problems Reported by Planters

Several problems were identified of which some were related to project management while others were related to planters' daily living. These are briefly discussed here:

Participation and Information Flow

Though planters were supposed to participate in project implementation activities, it was found that they participated only as wage labourers. Even though the leader attended some project meetings where policy and project activities were discussed, he played no part in decision-making. The project manager took all decisions and his sub-ordinate staff carried out his instructions. The flow of information in the USP is poor; planters (100%) do not even know the actual objectives (as stated in the project proposal) nor do they know who will manage the rubber plantation and rubber factory after the project-funding period ends. Project staff said that there would be a central management committee (CMU) consisting of 11 members—including the village leader—to manage the rubber plantation and its production and sales, and distribute benefits to the planters for 40 years after which the plantation will no longer be productive. However, the planters knew nothing of this, and the

project authority needs to disseminate this information to planters. The planters' experience of receiving unequal settlement money leaves them suspicious that there will be an inequitable revenue distribution from the sale of rubber. There is also no policy on the future of the rubber plantation after 40 years.

Drinking Water Availability and Quality

Planters (100%) reported non-availability, especially in dry seasons, of safe drinking water as the principal problem. Little water is available during the summer and winter seasons; the ring wells that the authority installed are either damaged or have water for 6 months only. When they are dry, polluted water is collected from streams or from a *kua* (a small well in a seepage area) 1–2 km from their houses. As people use this water to bathe and wash clothes, planters cannot drink from the *gudha*.¹² They suffer from water-transmitted diseases every year. During the study, it was noticed that one rich planter who has a small tea stall-cum-grocery-shop, has installed a tube well.

Child Education, Medical Facilities and Public Hygiene

The primary school, established by the project, closed in 2004 when communications between the project and the education authorities broke down. Planters are now unable to send their children to school because other schools are too far from their village (3–5 km). They have requested the authority to take steps to reopen the school. Planters face difficulty in obtaining medical treatment due to distance to a health centre (9 km) and the absence of a trained local practitioner. The project authority can request officials of the primary health care department to provide training in first aid to selected persons. Planters commented that the pits they dig for toilets fall in quickly because the soil is loose and sandy. They asked for concrete rings and stances for building new latrines. The local government council can supply rings and tops free or at a nominal cost under their sanitation programs. The project authority, in cooperation with local government, can take steps to install hygienic toilets throughout the village.

Seasonal Problems

Lack of jobs and difficult transport conditions in the rainy season are a severe problem. Planters reported that almost all chickens died of unknown diseases in the rainy season. Vaccinations may prevent this problem. They lack warm clothes and children suffer cold-related diseases in winter as well as outbreaks of water-transmitted diseases in summer.

¹² The project authority built an earthen cross dam (90 m long and 30 m wide) between the bases of two adjacent hills that holds water all year.

Concluding Comments

The immediate project incentives—in the form of a ready-built house, material support and settlement money, and employment opportunity—encouraged planters to contribute effectively in the project. The planters said that the perceived benefits from agroforestry and long-term jobs in the rubber plantation as well as future benefits from the share of revenue from rubber sales equally influenced them to work together for the success of the project.

Even though there are three ethnic communities in the study village, they have strong social cohesion and there is no incidence of notable conflict. They all have faith in and respect their village leader, his activities and his responsibilities. The leader always tries to provide job opportunities for the planters in need. These conditions help them to act collectively for the wellbeing of their society as well as the project.

The project has contributed to the enhancement of the planters' livelihood through the creation of opportunities to build several forms of livelihood capital. At the same time it has reduced land degradation through the expansion of forest cover and adoption of soil conserving agroforestry practices. NGO services and contact with officials have assisted in diversifying livelihood strategies thereby reducing dependency on project resources. Rich planters have been able to expand their income sources and hence are becoming wealthier. Moreover, the USP has opened the avenue for them to increase their networks. Poor planters still remain wage labourers because they have insufficient finance and networks to invest in productive ventures. Most of the planters still exist from hand-to-mouth which suggests that the USP has not been successful in attaining the objectives of improving planters' livelihoods. All planters across the three wealth categories are unhappy that they have not gained land certificates, that the school has closed and that there are few job opportunities in the project village.

The project-funding period ended in 2007 and for the continuity of the project activities the following policy implications are drawn:

- Effective participation of planters in rubber management will be crucial. The social capability of planters required for plantation management appears to be adequate, and they have regular contact with project staff. The project authority could utilize these assets for the management of the rubber plantation.
- Planters need to be well-informed about the central management unit, rubber revenue distribution policy, the fate of the unproductive rubber plantation after 40 years, and who will manage the land and for what purposes. These issues need to be addressed immediately to ensure the continuity of the project activities, for the wellbeing of the planters and for the development of degraded upland.
- A temporary policy prohibiting land distribution has delayed the issuing of land certificates, and the project authority needs to take steps to resolve this impasse. Individual tenure for homesteads and collective tenure for the rubber plantation has been suggested. Collective tenure would enhance the management of the rubber plantation and after 40 years of rubber production the land could be

utilized for other suitable purposes such as for agroforestry jointly under the supervision of CHTDB. The project also acquired some private land from some planters but has yet to pay compensation and this issue needs to be resolved.

- There are opportunities to increase income-generating activities through the promotion of small-scale cottage industries including textiles, bamboo and cane based products. Ethnic people are skilled in these activities and these products have both local and regional market demand. Both NGOs and the project authority should take the initiative in this regard.

Findings of this paper taking one village as a case study may not represent the overall situation of the project in all 10 villages. The outcomes of the project may be different in other villages, hence a comprehensive study by sampling more project villages may be warranted.

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